A NEW HYBRID FLESHY-FRUITED PRICKLY-PEAR IN CALIFORNIA

Malcolm G. McLeod
Department of Biological Sciences,
California Polytechnic State University,
San Luis Obispo 93407

Only two species of prickly-pear cacti grow in San Luis Obispo County, California. These are *Opuntia phaeacantha* Engelm. var. *major* Engelm. and the Indian-fig cactus, *O. ficus-indica* (L.) Miller *(Opuntia* series *Opuntiae).*

Opuntia phaeacantha var. *major* is widespread in southwestern United States. Its northwesternmost station is at Radio Tower Hill on the campus of California Polytechnic State University. In San Luis Obispo County it is found on south- and/or west-facing slopes near the coast and in Cuyama Valley. All of the populations are morphologically rather uniform.

The spiny form of *Opuntia ficus-indica* ("megacantha" sensu Benson, 1969a) was introduced into California by the mission fathers in the late eighteenth century (Benson and Walkington, 1965). It and the spineless form were planted for their edible fruits and as a source of mucilaginous binding material for adobe bricks. They were planted at missions and rancheros in southern and central California and elsewhere in the Southwest. There are numerous populations in the San Luis Obispo area on hillsides and along water courses; one large clone growing on the southeastern flanks of Mt. San Luis Obispo is apparently an escape from the original mission garden.

Opuntia phaeacantha var. *major* is usually prostrate (occasionally suberect), rarely exceeding 30 cm in height. Stem joints are obovate, averaging about 15 cm long by 11 cm wide. Spines are brown to reddish-brown with white tips and 3.5–7.5 cm long. Fruits are obovoid and wine-colored.

Opuntia ficus-indica "megacantha" is tree-like, 3–5 m tall. Stem joints are obovate or oblong, 30–60 cm long by 20–40 cm wide. Spines are white and 1.0–2.5 cm long. Fruits are nearly spherical and yellow or pale orange.

These two cacti grow in close proximity on steep, west-facing slopes of Hospital Hill in northeastern San Luis Obispo. Three individual plants that are intermediate, for the characters mentioned above (as well as others), between *Opuntia ficus-indica* "megacantha" and *O. phaeacantha* var. *major* were found on this hillside. These intermediates are shrubby to sprawling, about 1.0–1.5 m tall. Stem joints are obovate averaging about 20 cm long by about 15 cm wide. Spines are light yellow, slightly

darker at the base and average 3.0–3.6 cm long. Fruits are obovoid, orange.

Cytological studies (Pinkava and McLeod, 1971; Pinkava et al., 1973) indicate that *O. ficus-indica* is octoploid ($8x = 88$) and that *O. phaeacantha* var. *major* is hexaploid ($6x = 66$). The expected chromosome number of the hybrid between these two taxa is therefore $7x = 77$.

Flower buds for the two putative parental taxa and the intermediate were collected from representative plants from the Hospital Hill population during spring 1974. Acetocarmine squash preparations were made using procedures previously described (Pinkava et al., 1973). Voucher specimens are on deposit in OBI and ASU.

Meiotic chromosome counts were obtained from *O. phaeacantha* var. *major (McLeod 1265)*, $n = 33$, and from *O. ficus-indica* "megacantha" *(McLeod 1255)*, $n = 44$. In the intermediate *(McLeod 1254)*, a prophase II configuration indicated that a 38/39 anaphase I separation had occurred. In a cell at diakinesis, 29 bivalents, one univalent, three tetravalents, and one ring-of-six chromosomes were found ($2n = 77$). This is the first odd-ploid interspecific natural hybrid to be recorded for the Cactaceae.

Walkington (1966) has indicated that *O. oricola* Philbrick of southern California coastal regions may have originated as a hybrid between *O. ficus-indica* "megacantha" and some member of the "*O. phaeacantha* complex". He also suggested that the "*O. demissa*" form found farther inland may have originated through hybridization between *O. phaeacantha* var. *discata* (Griffiths) Benson & Walkington, *O. littoralis* (Engelm.) Cockerell var. *austrocalifornica* Benson & Walkington, and *O. ficus-indica*. Walkington has also stressed hybridization between the naturally occurring cismontane taxa and *O. ficus-indica* in the development of the "*O. littoralis* complex" as it presently exists.

Benson (1969b) postulates the origin of *Opuntia dillei* Griffiths of western Texas and southern New Mexico through hybridization between *O. ficus-indica* and *O. phaeacantha* var. *discata* or var. *major*. I have presented a hybridization scheme for possible origin of the "*O. phaeacantha* complex" of Arizona (McLeod, 1973). Information that crosses such as that of the Hospital Hill intermediate are possible may aid in unravelling taxonomic problems such as these. Cytological studies and a breeding program should yield much additional information regarding these taxa.

Evidence for the origin of the plants from Hospital Hill as a hybrid between *O. phaeacantha* var. *major* and *O. ficus-indica* "megacantha" is summarized as follows: (1) distinct intermediacy of habit, pad size and shape, spine length and color, and fruit size, shape, and color; (2) intermediate chromosome number ($2n = 77$); (3) absence of other prickly-pear species in the vicinity [the nearest being *O. littoralis* var. *littoralis*, 48 km away at northern edge of Santa Maria Valley (Benson, 1969a), although recent observations indicate that Santa Barbara populations

160 km away probably represent the nearest extant populations]. Only three hybrid individuals (most probably first generation progeny) are known; a search of other areas of San Luis Obispo County where the two taxa co-exist has not revealed additional intermediates. Discovery of these natural hybrids could be extremely important in further taxonomic studies of the fleshy-fruited prickly-pears.

Literature Cited

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Argemone munita (Papaveraceae): Range Extension and Morphological Notes.—The range of *Argemone munita* Dur. & Hilg. has been extended north and west: California, Trinity County, 8 km NW Stuart Gap on Forest Service Road 28N10, Trinity National Forest, T2S, R11W, sec. 25, 1370 m, 12 June 1973, *Hohn 1085* with Louise Sparks, WTU. A small population was observed on a southeast-facing embankment and roadside ditch. A review of pertinent literature revealed localities for this species along the eastern slopes of the Sierra Nevada north to Shasta County and in the coast ranges to Lake and Colusa Counties, California (G.B. Ownbey, Mem. Torrey Bot. Club 21(1). 1958).

In his monograph, Ownbey stated that *A. munita* is a highly variable species and that precise definition of it is difficult. Four subspecies were described and intermediates (putative hybrids) occur between two of them: subsp. *munita* and subsp. *rotundata* (Rydb.) G. Ownbey. Specimens from localities nearest Trinity County (Shasta County) are intermediate between these two subspecies. Plants from Trinity County are atypical within the morphological limits set for *A. munita* and appear to be aberrant forms unlike any of the described variants or intermediates. A character frequently used in recognizing aberrant forms within the species is the indurated apical spine of the sepal horn. The spine tends to be flattened and enlarged at its juncture with the herbaceous lower part of the horn in plants from the new locality. Such aberrant forms pose taxonomic problems, yet a conservative course in this case is probably the wisest one. In spite of obvious objections, these plants should be assigned provisionally to subsp. *munita* (pers. comm. G.B. Ownbey). Further collection and study of *A. munita* in the Stuart Gap area is desirable.—Janet E. Hohn, Department of Botany, University of Washington, Seattle 98195.